CLAIMS

What is claimed:

1	1.	A method for forming a semiconductor device comprising:
2		forming a 3-dimensional (3D) pattern in a substrate; and
3		depositing at least one material over the substrate in accordance with desired
4	charac	teristics of the semiconductor device.
1	2.	The method of claim 1 wherein forming the 3D pattern further comprises:
2		depositing a layer of material onto the substrate;
3		imprinting a 3D pattern into the layer of material; and
4		transferring the 3D pattern into the substrate.
1	3.	The method of claim 1 wherein the semiconductor device comprises a cross-point
2	memor	ry array.
1	4.	The method of claim 2 wherein the semiconductor device is at least one of a
2	transis	tor, a resistor, a capacitor, a diode, a fuse and an anti-fuse.
1	5.	The method of claim 2 wherein imprinting a 3D pattern into the layer of material
2	further	comprises utilizing a 3D stamping tool to create the 3D pattern.
1	6.	The method of claim 2 wherein imprinting a 3D pattern into the layer of material
2	further	comprises utilizing a molding process to imprint the 3D pattern into the layer of
3	materi	al.

1	7.	The method of claim 2 wherein the layer of material comprises a polymer
2	materi	al.
1	8.	The method of claim 2 wherein the layer of material comprises a photo-resist
2	materi	al.
1	9.	The method of claim 2 wherein transferring the 3D pattern into the substrate
2	include	es:
3		removing a portion of the layer of material thereby exposing a portion of the
4	substra	ate;
5		etching the exposed portion of the substrate;
6		removing another portion of the layer of material thereby exposing a second
7	portion	n of the substrate;
8		etching the second portion of the substrate; and
9		removing a remaining portion of the layer of material.
1	10.	The method of claim 3 wherein depositing at least one material over the substrate
2	further	comprises:
3		depositing two sets of conductors with a semiconductor layer there between to form
4	row an	d column electrodes overlaid in such a manner that each of the row electrodes
5	interse	cts each of the column electrodes at exactly one place.
1	11.	The method of claim 9 wherein depositing at least one material over the substrate
2	further	comprises:

14.

1

3		depositing a first metal layer on the substrate;
4		applying a first planarizing polymer to the metal layer;
5		removing a portion of the first planarizing polymer;
6		utilizing the first planarizing polymer as an etch mask to etch the first metal layer
7	thereb	y leaving a remaining portion of the first metal layer;
8		etching the substrate in a selective fashion; and
9		removing the first planarizing polymer.
1	12.	The method of claim 11 wherein depositing at least one material over the
2	substra	ate further comprises:
3		depositing a second metal layer on the remaining portion of the first metal layer;
4		applying a second planarizing polymer to the second metal layer;
5		removing a portion of the second planarizing polymer;
6		utilizing the second planarizing polymer as an etch mask to etch the second metal
7	layer;	and
8		removing the second planarizing polymer.
1	13.	A system for forming a semiconductor device comprising:
2		means for forming a pattern in a substrate wherein the pattern is 3-dimensional
3	and	
4		means for depositing at least one semiconductor material over the substrate in
5	accord	lance with desired characteristics of the semiconductor device.

The system of claim 13 wherein the semiconductor device comprises a cross-point

2	memo	memory array.		
1	15.	The system of claim 13 wherein the means for forming the pattern further		
2	compr	rises:		
3	_	means for depositing a layer of material onto the substrate;		
4		means for imprinting a 3D pattern onto the layer of material; and		
5		means for transferring the 3D pattern into the substrate.		
1	16.	The system of claim 14 wherein the means for depositing at least one		
2	semic	onductor material over the substrate further comprises:		
3		means for depositing two sets of conductors with a semiconductor layer there		
4	betwee	en to form row and column electrodes overlaid in such a manner that each of the row		
5	electro	odes intersects each of the column electrodes at exactly one place.		
1	17.	The system of claim 14 wherein the semiconductor device is at least one of a		
2	transis	stor, a resistor, a capacitor, a diode, a fuse and an anti-fuse.		
1	18.	The system of claim 15 wherein the means for imprinting a 3D pattern into the layer		
2	of mat	terial further comprises means for implementing a molding process to imprint the 3D		
3	patter	n into the layer of material.		
1	19.	The system of claim 15 wherein the means for transforming the 2D nottom into the		
1		The system of claim 15 wherein the means for transferring the 3D pattern into the		
2	substr	rate includes:		
3		means for removing a portion of the layer of material thereby exposing a portion		

4	of the	substrate;
5		means for etching the exposed portion of the substrate;
6		means for removing another portion of the layer of material thereby exposing a
7	second	l portion of the substrate;
8		means for etching the second portion of the substrate; and
9	means	for removing a remaining portion of the layer of material.
1	20.	The system of claim 15 wherein the means for imprinting a 3D pattern onto the
2	layer o	of material further comprises means for utilizing a 3D stamping tool to create the 3D
3	pattern	1.
1	21.	The system of claim 15 wherein the means for depositing at least one
2	semico	onductor material over the substrate further comprises:
3		means for depositing a first metal layer;
4		means for applying a planarizing polymer to the first metal layer;
5		means for removing a portion of the planarizing polymer;
6		means for utilizing the planarizing polymer as an etch mask to etch the first meta
7	layer t	hereby leaving a remaining portion of the first metal layer;
8		means for etching the substrate in a selective fashion; and
9		means for removing the planarizing polymer.
1	22.	The system of claim 15 wherein the layer of material comprises a polymer
2	materi	al.

26.

1	23.	The system of claim 15 wherein the layer of material comprises a photo-resist	
2	materia	al.	
1	24.	The system of claim 21 wherein the means for depositing at least one	
2	semico	onductor material over the substrate further comprises:	
3		means for depositing a second metal layer on the remaining portion of the first	
4	metal layer;		
5		means for applying a second planarizing polymer to the second metal layer;	
6		means for removing a portion of the second planarizing polymer;	
7		means for utilizing the second planarizing polymer as an etch mask to etch the	
8	second	l metal layer; and	
9		means for removing the second planarizing polymer.	
1	25.	A method for forming a semiconductor device comprising:	
2		forming a 3-dimensional (3D) pattern in a substrate;	
3		depositing a first metal layer on the substrate;	
4		applying a first planarizing polymer to the metal layer;	
5		removing a portion of the first planarizing polymer;	
6		utilizing the first planarizing polymer as an etch mask to etch the first metal layer	
7	thereb	y leaving a remaining portion of the first metal layer;	
8		etching the substrate in a selective fashion; and	
9		removing the first planarizing polymer.	

The method of claim 25 wherein the semiconductor device comprises a cross-

2	point memory array.		
1	27.	The method of claim 25 further comprising:	
2		depositing a second metal layer on the remaining portion of the first metal layer;	
3		applying a second planarizing polymer to the second metal layer;	
4		removing a portion of the second planarizing polymer;	
5		utilizing the second planarizing polymer as an etch mask to etch the second metal	
6	layer;	and	
7		removing the second planarizing polymer.	
1	28.	A semiconductor device comprising:	
2		a substrate wherein the substrate comprises a 3D pattern formed therein;	
3		at least one material deposited thereon in accordance with desired characteristics	
4	of the	semiconductor device.	
1	29.	The semiconductor device of claim 28 wherein the 3D pattern is formed with the	
2	follow	ing process:	
3		depositing a layer of material onto the substrate;	
4		imprinting a 3D pattern into the layer of material; and	
5		transferring the 3D pattern into the substrate.	
1	30.	The semiconductor device of claim 29 wherein transferring the 3D pattern into the	
2	substr	ate includes:	
3		removing a portion of the layer of material thereby exposing a portion of the	

4	substrate;	
5	etching the exposed portion of the substrate;	
6	removing another portion of the layer of material thereby exposing a second	
7	portion of the substrate;	
8	etching the second portion of the substrate; and	
9	removing a remaining portion of the layer of material.	